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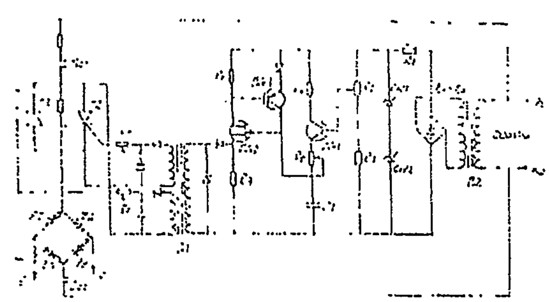
[54]实用新型名称 直流弧焊机

[57]摘要

直流弧焊机,包括用于产生可控硅控制栅极调制信号的控制电路;用于响应所述控制电路控制栅极信号,使主焊回路通断的执行电路;和响应供电回路过流过压,产生断电或报警信号或动作的保护电路。本实用新型省去了一般弧焊机所必需的铁芯,体积小,重量轻,只须对焊枪上旋钮进行调节,即可大范围地调节焊接电流、电压,使用起来十分方便。



(BJ)第1452号

权 利 要 求 书

1、直流弧焊机，包括焊枪1、机厢2、风机9，其特征在于它还包括用于产生可控硅控制栅极控制信号的控制电路；用于响应所述控制电路控制栅极信号，使主焊回路通断的执行电路；和响应供电回路过流过压，产生断电或报警信号和动作的保护电路；其中控制电路输出与执行电路可控硅栅极相连。

2、按权利要求1所述的直流弧焊机，其特征在于所述控制电路由稳压二极管Z1、Z2、Z3、Z4，可变电阻R2，电阻R3、R4、R5、R7，电容器C1，初级三极管BG1，输出三极管BG2、BG3和变压器B1组成；变压器B1的输出抽头与执行电路中的可控硅T2，T3控制栅极相连；所述执行电路由可控硅T2、T3，二极管Z5、Z6、Z7、Z8和继电器S2的常开触点S21、S22连接组成。

3、按权利要求1所述的直流弧焊机，其特征在于所述控制电路包括三套由三相电源通过变压器B32、B33、B34供电的单相控制电路，每套单相控制电路分别由整流二极管，初级三极管BG31，输出三极管BG32，BG33，可变电阻R35，电容器C31和输出变压器B31连接组成；其中各套初级三极管BG31的基极并联连接在可变电阻R32上；所述执行电路包括三套单相执行电路，每套单相执行电路由可控硅Ti、Tj（i=4，6，8；j=5，7，9）继电器S2的常开触点S2i（i=4，5，6），二极管Zi（i=35，36，37，38，39，40）连接组成；其中可控硅Ti，Tj（i=4，6，8；j=5，7，9）的控制栅极分别与对应相的单相控制电路输出变压器B31的输出抽头相连。

4、按权利要求1所述的直流弧焊机，其特征在于所述保护电路包括由开关K，常闭触点S31，继电器J1构成的回路，继电器S2，常开触点J11，常闭触点S32串联支路和与焊把线E、F通过电容相连的继电器S3串联支路构成。

5、按权利要求2或3或4所述的直流弧焊机，其特征在于所述可变电阻R2或R32，开关K安装在焊枪1上。

说　　　明　　　书

直流弧焊机

本实用新型涉及一种直流弧焊机。

目前国内外使用的弧焊机带有笨重铁芯，这种现有技术存在下述问题：1．体积大重量大，浪费了大量的无功损耗和有色金属。2．不能遥控作业。有时焊工在高空或在沟洞内工作，远离电焊机焊接，当需要调节焊接电流时，需要回到电焊机处调节，影响劳动效率。

本实用新型的目的是提供一种无铁芯，可以遥控调节电流电压的直流弧焊机。

本实用新型的目的是这样实现的，根据本实用新型的特征，它还包括用于产生可控硅控制栅极控制信号的控制电路；用于响应所述控制电路控制栅极信号，使主焊回路通断的执行电路；和响应供电回路过流过压，产生断电或报警信号和动作的保护电路；其中控制电路输出与执行电路可控硅栅极相连。根据本实用新型更详细的特征，所述控制电路由稳压二极管Ｚ１、Ｚ２、Ｚ３、Ｚ４，可变电阻Ｒ２，电阻Ｒ３、Ｒ４、Ｒ５、Ｒ７，电容器Ｃ１，初级三极管ＢＧ１，输出三极管ＢＧ２、ＢＧ３和变压器Ｂ１组成；变压器Ｂ１的输出抽头与执行电路中的可控硅Ｔ２，Ｔ３控制栅极相连；所述执行电路由可控硅Ｔ２、Ｔ３，二极管Ｚ５、Ｚ６、Ｚ７、Ｚ８和继电器Ｓ２的常开触点Ｓ２１、Ｓ２２连接组成。本实用新型也可以是这样的，所述控制电路包括三套由三相电源通过变压器Ｂ３２、Ｂ３３、Ｂ３４供电的单相控制电路，每套单相控制电路分别由整流二极管，初级三极管ＢＧ３１，输出三极管ＢＧ３２，ＢＧ３３，可变电阻Ｒ３５，电容器Ｃ３１和输出变压器Ｂ３１连接组成；其中各套初级三极管ＢＧ３１的基极并联连接在可变电阻Ｒ３２上；所述执行电路包括三套单相执行电路，每套单相执行电路由可控硅Ｔｉ、Ｔｊ（ｉ＝４，６，８；ｊ＝５，７，９）继电器Ｓ２的常开触点Ｓ２ｉ（ｉ＝４，５，６），二极管Ｚｉ（ｉ＝３５，３６，３７，３８，３９，４０）连接组成；其中可控硅Ｔｉ，Ｔｊ（ｉ＝４，６，８；ｊ＝５，７，９）的控制栅极分别与对应相的单相控制电路输出变压器Ｂ３１的输出抽头相连。所述保护电路包括由开关

K，常闭触点S 3 1，继电器J 1构成的回路，继电器S 2，常开触点J 1 1，常闭触点S 3 2串联支路和与焊把线E、F通过电容相连的继电器S 3串联支路构成。所述可变电阻R 2或R 3 2，开关K安装在焊枪1上。

与现有技术相比，本实用新型的优点和积极效果是显著的。1．本实用新型体积小，重量轻，本实用新型省去了一般弧焊机所需要的铁芯，采用可控硅调流、调压，节省了大量的有色金属。2．本实用新型可进行遥控操作，焊工只须对焊枪上旋钮进行调节，即可大范围地调节电流的大小，而不须离开工作地点到焊厢处扳调开关，提高了劳动效率。3．本实用新型空载电压低，符合有关国家标准。

图1是本实用新型整机结构示意图。

图2是本实用新型第一种实施例电路原理图。

图3是本实用新型第二种实施例控制电路原理图。

图4是本实用新型第二种实施例执行电路原理图。

图5是本实用新型保护电路原理图。

参见图1，本实用新型内焊枪1、机厢2、调节开关3、电路板4组成，在机厢2前侧安装有指示灯5、电压、电流表6、电源插头7、机厢2上方安有风机9，焊枪和机厢2由电缆8连接。

参见图2，示出了本实用新型应用于单相电源情况下的实施例。在本实施例中，电源为2 2 0 V单相交流电，本实施例电路由控制电路执行电路和保护电路组成，控制电路由变压器B 2，稳压整流二极管Z 1、Z 2、Z 3、Z 4、CW 1、CW 2，初级三极管B G 1、输出三级管B G 2、B G 3，调节电阻R 2，变压器B 1，可变电阻R 8、R 9组成。2 2 0伏电源经同步变压器B 2降压，供给Z 1、Z 2、Z 3、Z 4、整流，R 1降压限流，稳压管CW 1、CW 2削波稳压，电阻R 2、R 3构成的分压电路提供给初级三极管B G 1一个控制放大信号，当电容C 1被充电至峰值时，电容C 1对三极管B G 2的发射极放电，从而在B G 2发射极相连的电阻R 7上产生一个脉冲信号，经变压器B 1在可变电阻R 8、R 9一端输出可控硅T 3、T 2的栅极控制电压信号。

执行电路由两个反向并接的可控硅T 2、T 3和电感扼流圈L，单相桥式

整流二极管Z５、Z６、Z７、Z８组成，其中图中E、F两点分别和焊枪及焊件相连，E点和整流二极管Z５、Z７回路串接有电感L，２２０V电源回路上串接有继电器S２的常开触点S２１、S２２。可控硅T２、T３的通断由变压器B１的输出调节控制。

参见图３和图４，示出了本实用新型第二种实施例电路原理图。在本实施例中，采用三相电源供给同步变压器B３２、B３３、B３４，经变压器降压供给图４中A、B、C三套可控硅控制电路。如图中虚线方框所示，其中B相控制电路与A相控制电路相同。本实施例中各套控制电路的工作原理与第一实施例中单相供电情况类似。但在本实施例中，调节电阻R３２上的电压由变压器B３２、B３３、B３４的a、b、c抽头经Z３５～Z４０桥式整流提供，调节电阻R３２的分压提供给初级三极管BG３１、输出三极管BG３２、BG３３一个控制放大信号。可变电阻R３８、R３９用于调节三路控制电路输出触发信号的对称度。在本实施例中，主回路和变压器B３２、B３３、B３４均由A、B、C三相四线制的母线供电。图３与图４标号相同的点线互相连接。

为保证焊机能在正常温度下工作，本实用新型针对不同实施例设置了单相或三相风机FJ，当焊机工作时，风机FJ随之打开，使焊机厢内降温。

本实用新型执行电路所采用的可控硅，其正反向耐压应大于１２００V，附图中所画的为单向可控硅，若以双向可控硅取代一相中的两个单向可控硅，本实用新型亦可正常工作，这时变压器B３１的输出抽头仅需一对即可，抽头之一经可变电阻调压，与双向可控硅控制栅极相连即可。

考虑到焊机的安全工作，本实用新型设置了保护电路，图５示出了本实用新型保护电路原理图。图中A、N分别与电源火线和零线相连，该保护电路由开关K、继电器S３常闭触点S３１、继电器J１串联回路，继电器J１常开触点J１１，继电器S３常闭触点S３２，风机继电器S１，主电路继电器S２串联支路，继电器S２的常开触点S２３和工作指示灯D１串联支路，继电器S３的常开触点S３３和故障指示灯D２串联支路，继电器S３的常开触点S３４和故障警铃DL串联支路，并联连接支路组成，它还包括继电器S３与焊接电源点E和地线点F连接支路。

保护电路是这样工作的，当要焊接时，先合上开关K经继电器S３的常开触点S３１，使继电器Ｊ１得电工作,常开触点Ｊ１１吸合,经常闭触点S３２使继电器S１、S２得电，主回路常开触点S２ｉ（ｉ＝１，２，３，４，５，６）吸合，工作指示灯亮D１，风机回路常开触点S１ｉ（ｉ＝１，２，３）吸合，风机工作，使焊机机厢降温。调节电阻R２或R３２，就可以达到调节可控硅导通角，调节焊机电流大小的目的。

发生故障时，如可控硅或二极管全被击穿，E、F之间有电源交流电串入，该电压经E或F点使继电器S３得电，S３的常开触点S３３、S３４吸合，常闭触点S３１、S３２断开故障指示灯D２发亮，故障警铃DL鸣响，常闭触点S３２断开，使风机停转，主电路继电器S２先电，原先闭合的常开触点S２ｉ（ｉ＝１，２，３，４，５，６）全部断开，焊机完全停电。若因某一相因高压串入大电流，本实用新型在主回路所串接的熔断器P即被熔断，使焊机断电停止工作，起到多重安全保护的作用。在这里，单相和三相焊机的保护电路结构是相同的。

本实用新型图１中的所示的调节开关３对于图２、图３实施例中开关K和可调电阻R２或R３２，当调节开关３拉出时，开关K接通，可调电阻R２或R３２可以通过调节开关３旋转得以调节，保护电路、执行电路、控制电路主要元器件安装在电路板４上。

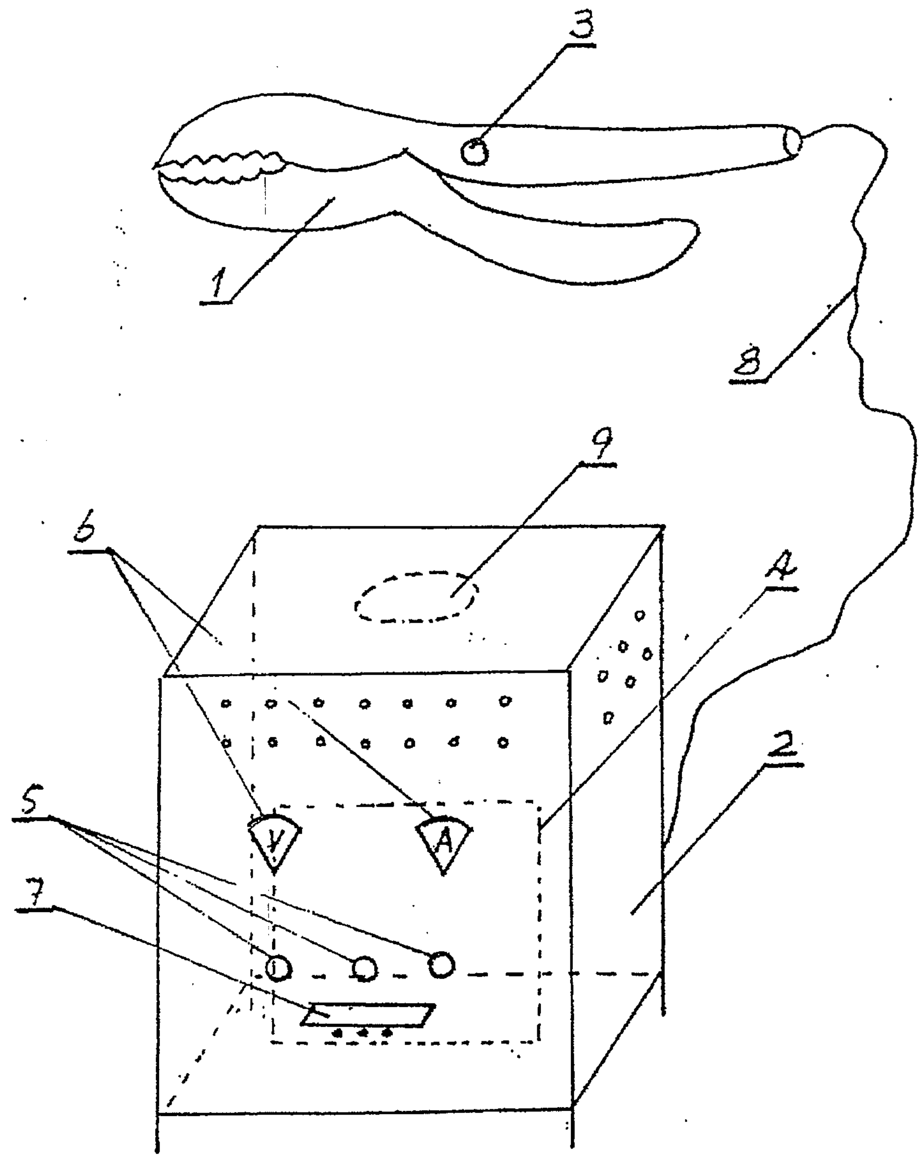


图 1

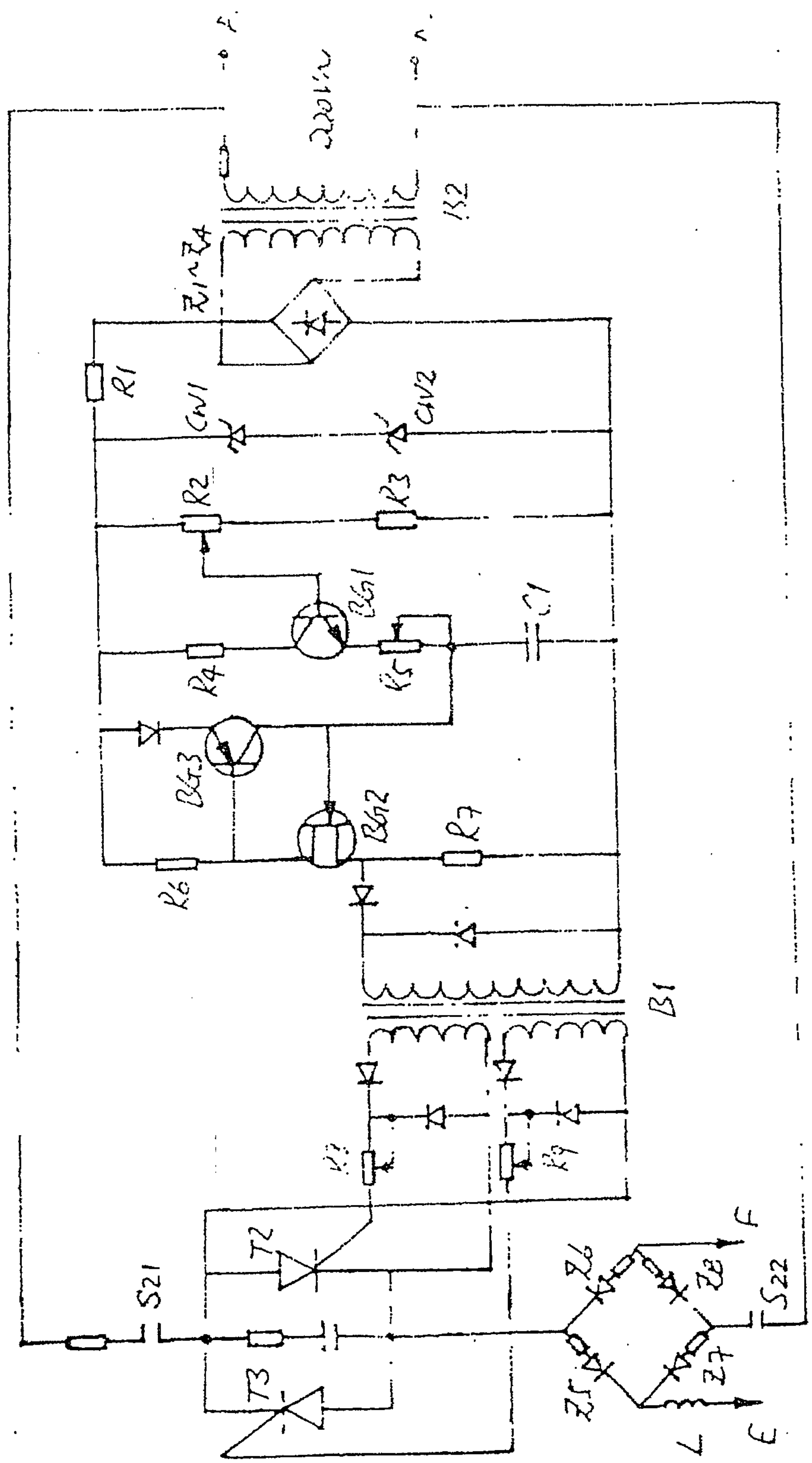

220V~
B2
Z1~Z4
R1
CW1
CW2
R2
R3
BG1
R4
R5
C1
BG3
BG2
R6
R7
B1
R8
R9
T2
T3
S21
S22
Z5
Z6
Z7
Z8
L
E
F

图 2

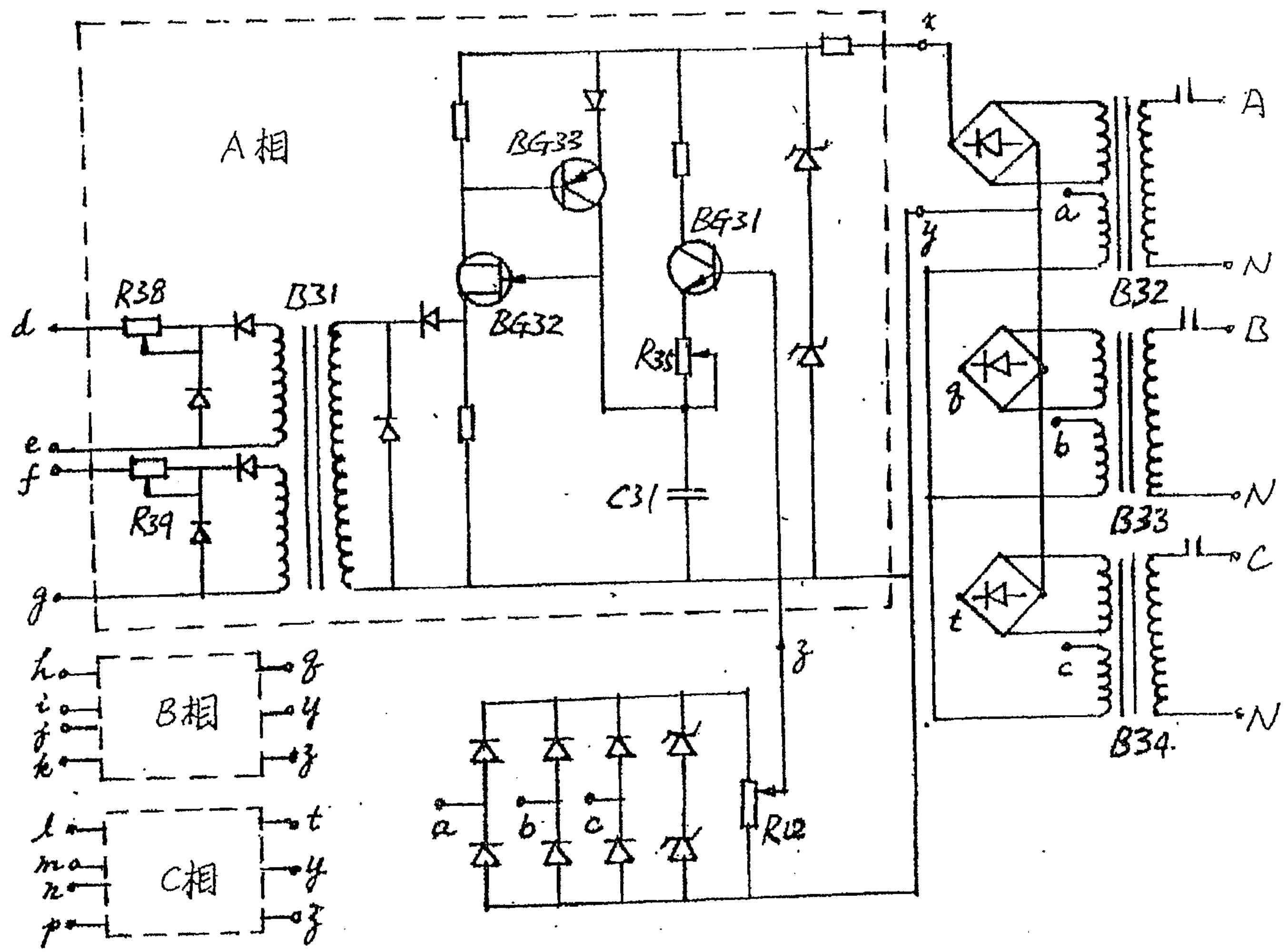

A相
B相
C相
R38
R39
B31
BG32
BG33
BG31
R35
C31
R12
B32
B33
B34
A
B
C
N
N
N

图 3

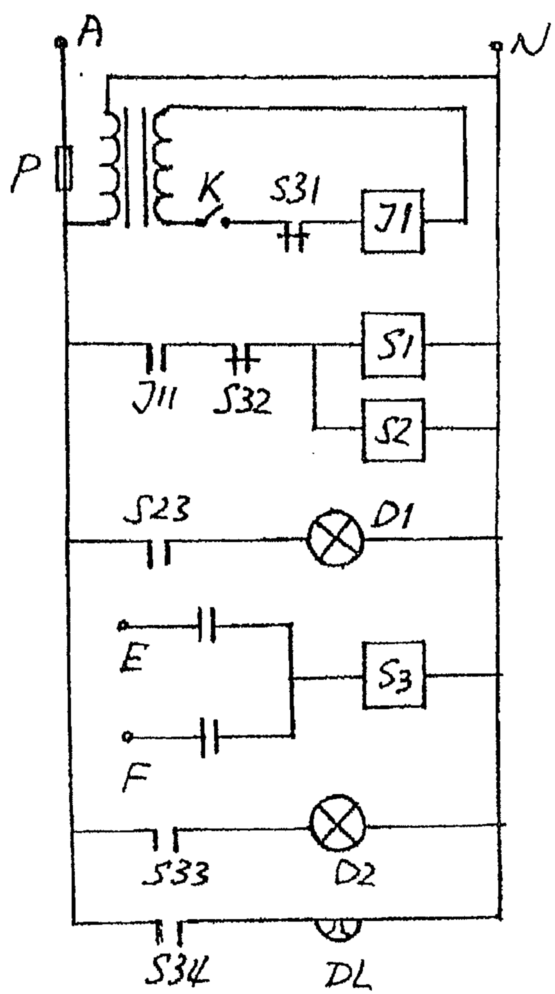

A
N
P
K
S31
J1
J11
S32
S1
S2
S23
D1
E
F
S3
S33
D2
S34
DL

图 5

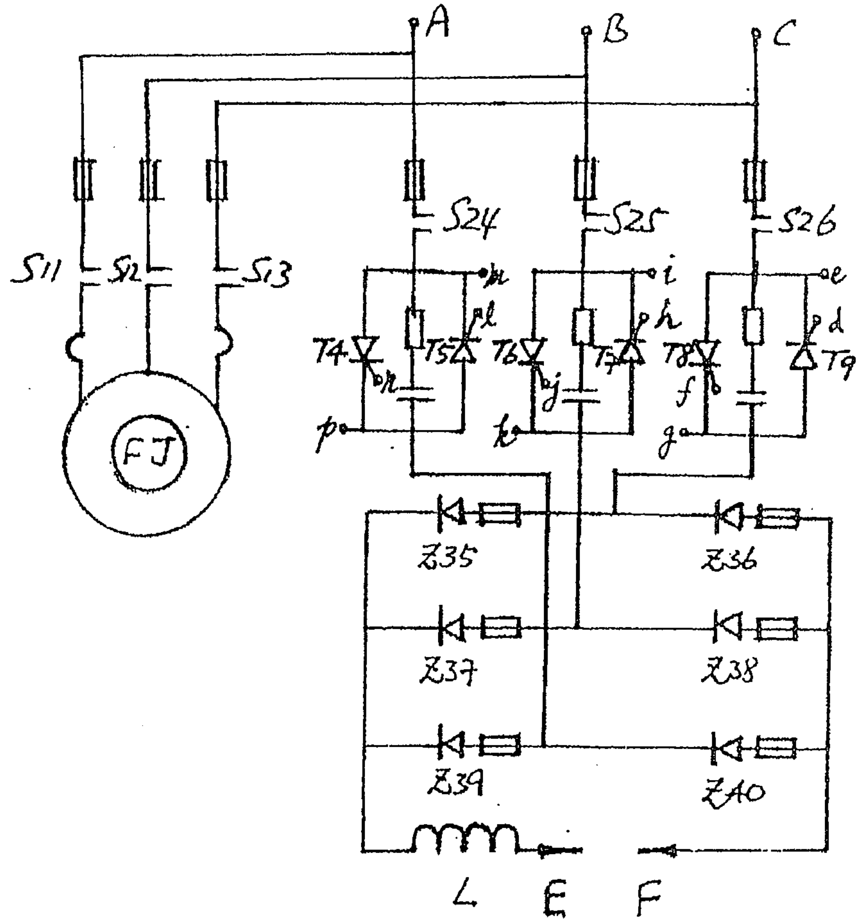

A
B
C
S11
S12
S13
FJ
S24
S25
S26
T4
T5
T6
T7
T8
T9
Z35
Z36
Z37
Z38
Z39
Z40
L
E
F

图 4

What is claimed is:

1. A direct current arc welder, comprising: a welding torch 1; an enclosure 2; a fan 9; characterized in that the direct current arc welder also comprises a control circuit for generating a control signal of a controlled-silicon control gate electrode; an executive circuit for turning on or off a main welding loop in response to the control signal of the control gate electrode generated by the control circuit; and a protection circuit for generating a power-off or alarming signal or action in response to the over-current and/or over-voltage of a power supplying loop; wherein the output end of the control circuit is connected to the controlled-silicon gate electrode of the executive circuit.

2. The direct current arc welder according to claim 1, characterized in that the control circuit consists of voltage stabilizing diodes Z1, Z2, Z3, Z4, a variable resistor R2, resistors R3, R4, R5, R7, a capacitor C1, a primary triode BG1, output triodes BG2, BG3, and a transformer B1, wherein an output tap of the transformer B1 is connected to the control gate electrode of the controlled silicon T2, T3 in the executive circuit; the executive circuit consists of the controlled silicon T2, T3, diodes Z5, Z6, Z7, Z8, and normally open contacts S21, S22 of a relay S2.

3. The direct current arc welder according to claim 1, characterized in that the control circuit comprises three sets of single-phase control circuits supplied with power via transformers B32, B33, B34 by a three-phase power supply, each set of single-phase control circuit consisting of a rectifier diode, a primary triode BG31, output triodes BG32, BG33, a variable resistor R35, a capacitor C31 and an output transformer B31; wherein the base electrode of each primary triode BG31 is parallel connected to the variable resistor R32; the executive circuit includes three sets of single-phase executive circuits, each of which consists of controlled-silicon Ti, Tj (i=4, 6, 8; j=5, 7, 9), normally open contacts S2i (i=4, 5, 6) of the relay S2, and diodes Zi (i=35, 36, 37, 38, 39, 40), wherein the control gate electrode of the controlled silicon Ti, Tj (i=4, 6, 8; j=5, 7, 9) is connected to the output tap of the output transformer B31 of the single-phase control circuit of a corresponding phase.

4. The direct current arc welder according to claim 1, characterized in that the protection circuit comprises a loop consisting of a switch K, a normally closed contact S31, a relay J1; a series branch consisting of the relay S2, a normally open contact J11 and a normally closed contact S32, and a series branch consisting of a relay S3 and welding wires E and F connected to the relay S3 via a capacitor.

5. The direct current arc welder according to claim 2 or 3, characterized in that the variable resistor R2 or R32 and the switch K are mounted on the welding torch 1.

DIRECT CURRENT ARC WELDER

TECHNICAL FIELD

The present utility model relates to a direct current arc welder.

BACKGROUND ART

Nowadays, the arc welders widely used domestically and overseas are provided with cumbersome iron cores. These welders involve the following disadvantages. Firstly, they are bulky and heavy, which results in the loss of much wattles power and the waste of non-ferrous metal. Secondly, they cannot be remotely controlled. For example, sometimes, workers performing high-altitude operation or working in caves are far away from the welder, and they have to return to the welder to adjust the welding current when necessary, which reduces work efficiency.

DISCLOSURE OF THE UTILITY MODEL

The object of the present utility model is to provide a direct current arc welder without an iron core, the current and voltage of the welder being adjustable by remote control.

The object of the present utility model is achieved in that, according to a characteristic feature of the present utility model, the direct current arc welder further comprises a control circuit for generating a control signal of a controlled-silicon control gate electrode; an executive circuit for turning on or off a main welding loop in response to the control signal of the control gate electrode generated by the control circuit; and a protection circuit for generating a power-off or alarming signal or action in response to the over-current and/or over-voltage of a power supplying loop; wherein the output end of the control circuit is connected to the controlled-silicon gate electrode of the executive circuit. According to a further characteristic feature of the present utility model, the control circuit consists of voltage stabilizing diodes Z1, Z2, Z3, Z4, a variable resistor R2, resistors R3, R4, R5, R7, a capacitor C1, a primary triode BG1, output triodes BG2, BG3, and a transformer B1, wherein an output tap of the transformer B1 is connected to the control gate electrode of the controlled silicon T2, T3 in the executive circuit; the executive circuit consists of the controlled silicon T2, T3, diodes Z5, Z6, Z7, Z8, and normally open contacts S21, S22 of a relay S2. According to a further characteristic feature of the present utility model, the control circuit comprises three sets of single-phase control circuits supplied with power via transformers B32, B33, B34 by a three-phase power supply, each set of single-phase control circuit consisting of a rectifier diode, a primary triode BG31, output triodes BG32, BG33, a variable resistor R35, a capacitor C31 and an output transformer B31; wherein the base electrode of each primary triode BG31 is parallel connected to the variable resistor R32; the executive circuit includes three sets of single-phase executive circuits, each of which consists of controlled-silicon Ti, Tj (i=4, 6, 8; j=5, 7, 9), normally open contacts S2i (i=4, 5, 6) of the relay S2, and diodes Zi (i=35, 36, 37, 38, 39, 40), wherein the control gate electrode of the

controlled silicon Ti, Tj (i=4, 6, 8; j=5, 7, 9) is connected to the output tap of the output transformer B31 of the single-phase control circuit of a corresponding phase. The protection circuit comprises a loop consisting of a switch K, a normally closed contact S31, a relay J1; a series branch consisting of the relay S2, a normally open contact J11 and a normally closed contact S32, and a series branch consisting of a relay S3 and welding wires E and F connected to the relay S3 via a capacitor. The variable resistor R2 or R32 and the switch K are mounted on the welding torch 1.

Compared to the prior art, the present utility model has the following advantages and effects. Firstly, it eliminates the use of an iron core necessary to general arc welders, which makes it compact and light; and the controlled silicon is employed to adjust the current and voltage, thereby saving a great deal of non-ferrous metal. Secondly, the welding current and voltage can be adjusted in a wide range simply by operating the knob provided on the welding torch, and thus the welder can be operated by remote control, which enhances work efficiency. Thirdly, the no-load voltage of the direct current arc welder is low, complying with the related national standard.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic view showing the structure of the welder of the present utility model.

Fig. 2 is a schematic diagram of the circuits of the first example of the present utility model.

Fig. 3 is a schematic diagram of the control circuit of the second example of the present utility model.

Fig. 4 is a schematic diagram of the executive circuit of the second example of the present utility model.

Fig. 5 is a schematic diagram of the protection circuit of the present utility model.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Fig. 1, the direct current arc welder of the present utility model comprises a welding torch 1, an enclosure 2, a regulating switch 3, a circuit board 4, the front side of the enclosure 2 being provided with an indicator light 5, a voltage/current meter 6 and a plug 7, the top side of the enclosure 2 being provided with a fan 9, and the welding torch 1 and the enclosure 2 being connected to each other via a cable 8.

Fig. 2 illustrates an example where the direct current arc welder of the present utility model uses a single-phase power supply. In the example, the power supply provides a single-phase 220V alternating current. The circuit of the direct current arc welder consists of the control circuit, the executive circuit and the protection circuit, wherein the control circuit consists of a transformer B2, voltage-stabilizing rectifier diodes Z1, Z2, Z3, Z4, CW1, CW2, a primary triode BG1, output triodes BG2, BG3, a regulating resistor R2, a transformer B1, and

variable resistors R8, R9. The 220V current is reduced in voltage by a synchronous transformer B2, rectified by diodes Z1, Z2, Z3, Z4, reduced in voltage and limited in current by the resistor R1, and damped and voltage-stabilized by voltage-stabilizing tubs CW1, CW2. The branch voltage circuit consisting of the resistors R2 and R3 provides the primary triode BG1 with a controllably amplified signal. When the capacitor C1 is charged to a peak value, it discharges to an emitting electrode of the triode BG2, whereby a pulse signal is generated in a resistor R7 connected to the emitting electrode of BG2. The gate electrode-controlling voltage signal of the controlled silicon T3, T2 is output from one end of the variable resistor R8 or R9 after the pulse signal is transformed by the transformer B1.

The executive circuit consists of controlled silicon T2, T3 connected to each other in reverse polarity, a chock L and single-phase bridge rectifier diodes Z5, Z6, Z7, Z8, wherein the two points E and F shown in Fig. 2 are connected to the welding torch and a workpiece to be welded, respectively, the chock L is series connected in the loop consisting of the point E and the rectifier diode Z5 or Z7, and the normally open contacts S21, S22 of the relay S2 are series connected in the 220V power supply loop. The switching of the controlled silicon T2 and T3 is controlled by adjusting the output of the transformer B1.

Figs. 3 and 4 show schematic diagrams of the circuits of the second example of the present utility model. In this example, the synchronous transformers B32, B33, B34 are supplied with power by a three-phase power supply, and the electric current is supplied to the three sets of the controlled-silicon control circuits A, B and C shown in Fig. 4 after the voltage is reduced by the transformers. As shown in the dashed block, the B phase control circuit is the same as the A phase control circuit. The operation principle of each set of the control circuit in this example is similar to that in this first example where the power supply is a single-phase one. However, in this example, the voltage applied to the regulating resistor R32 is provided by the taps a, b, c of the transformers B32, B33, B34 after the electric current is rectified by bridge rectifiers Z35-Z40. The branch voltage circuit of the regulating resistor R32 provides the primary triode BG31 and the output triodes BG32, BG33 with a controllably amplified signal. The variable resistors R38 and R39 are used to regulate the symmetry of the triggering signals output by three control circuit branches. In this example, the main loop and the transformers B32, B33, B34 are all supplied with power via a bus of a three-phase (A, B and C) four-wire system. The dotted lines with the same reference numerals in Figs. 3 and 4 are connected to each other.

To ensure that the welder can be operated at normal temperature, the direct current arc welder of the present utility model are provided with a single-phase or three-phase fan FJ in different examples. Once the welder is operated, the fan FJ is started, so as to lower the temperature in the enclosure of the welder.

The forward and backward withstand voltages of the controlled silicon used in the executive circuit of the direct current arc welder should be higher than 1200V. The controlled silicon shown in the figures is unidirectional. If two unidirectional controlled silicon of one phase are replaced by a bidirectional one, the welder of the present utility model can also be normally operated. Under this circumstance, only one pair of output taps of the transformer

B31 is required, and one of the taps is connected to the control gate electrode of the bidirectional controlled silicon after the voltage regulation by a variable resistor.

Considering the safety during the operation of the welder, the welder is provided with a protection circuit. Fig. 5 is a schematic diagram of the protection circuit of the present utility model. In this figure, A and N are connected to the live wire and the neutral wire of the power supply, respectively. The protection circuit comprises a series loop consisting of the switch K, the normally closed contact S31 of the relay S3 and the relay J1; a series branch consisting of the normally open contact J11 of the relay J1, the normally closed contact S32 of the relay S3, the relay S1 for the fan and the relay S2 for the main loop; a series branch consisting of the normally open contact S23 of the relay S2 and the working indicator light D1; a series branch consisting of the normally open contact S33 of the relay S3 and the fault indicator light D2, the series and parallel branches consisting of the normally open contact S34 of the relay S3 and the fault alarm DL. The protection circuit further comprises a connection branch consisting of the relay S3, the point E denoting the welding power supply and the point F denoting the ground wire.

The protection circuit works in the following way. When the welding operation is to be effected, the switch K is closed firstly, the relay J1 is supplied with power via the normally open contact S31 of the relay S3, the normally open contact J11 is picked up, the relays S1 and S2 are supplied with power via the normally closed contact S32, the normally open contacts S2i (i=1, 2, 3, 4, 5, 6) of the main loop are picked up, the working indicator light D1 is turned on, the normally open contacts S1i (i=1, 2, 3) of the fan loop are picked up, and the fan is started to lower the temperature in the enclosure of the welder. By regulating the resistor R2 or R32, the controlled silicon ducting angle and the current of the welder can be adjusted.

When there is a malfunction, the alternating current supplied by the power supply is generated and flows through E and F, if the controlled silicon or the diode is broken down. The relay S3 is powered by the current flowing through E or F, the normally open contacts S33, S34 of the relay S3 are picked up, the normally closed contacts S31, S32 are opened, the fault indicator light D2 is turned on, the fault alarm DL alarms, the normally closed contact S32 is opened, the fan is stopped, the main loop relay S2 is powered off, the normally open contacts S2i (i=1, 2, 3, 4, 5, 6) previously closed are all opened, and the welder is powered off. If a high current flows into a phase due to high voltage, the fuse P series connected in the main loop of the welder is blown, and thus the welder is totally powered off and stopped working, so that the welder of the present utility model is under multiple safety protection. The structure of the protection circuit of a single-phase welder is the same as that of a three-phase welder.

The regulating switch 3 shown in Fig. 1 corresponds to the switch K and the variable resistor R2 or R32 shown in Figs. 2 and 3. When the regulating switch 3 is pulled out, the switch K is turned on, and the variable resistor R2 or R32 can be adjusted by rotating the regulating switch 3. The main parts of the protection circuit, the executive circuit and the control circuit are mounted on the circuit board 4.